

# Event-Based Control of Simulated Human/ Robot Interactions using Parameterized Behavior Trees

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ALEXANDER SHOULSON, NORMAN I. BADLER  
COMPUTER AND INFORMATION SCIENCE  
UNIVERSITY OF PENNSYLVANIA



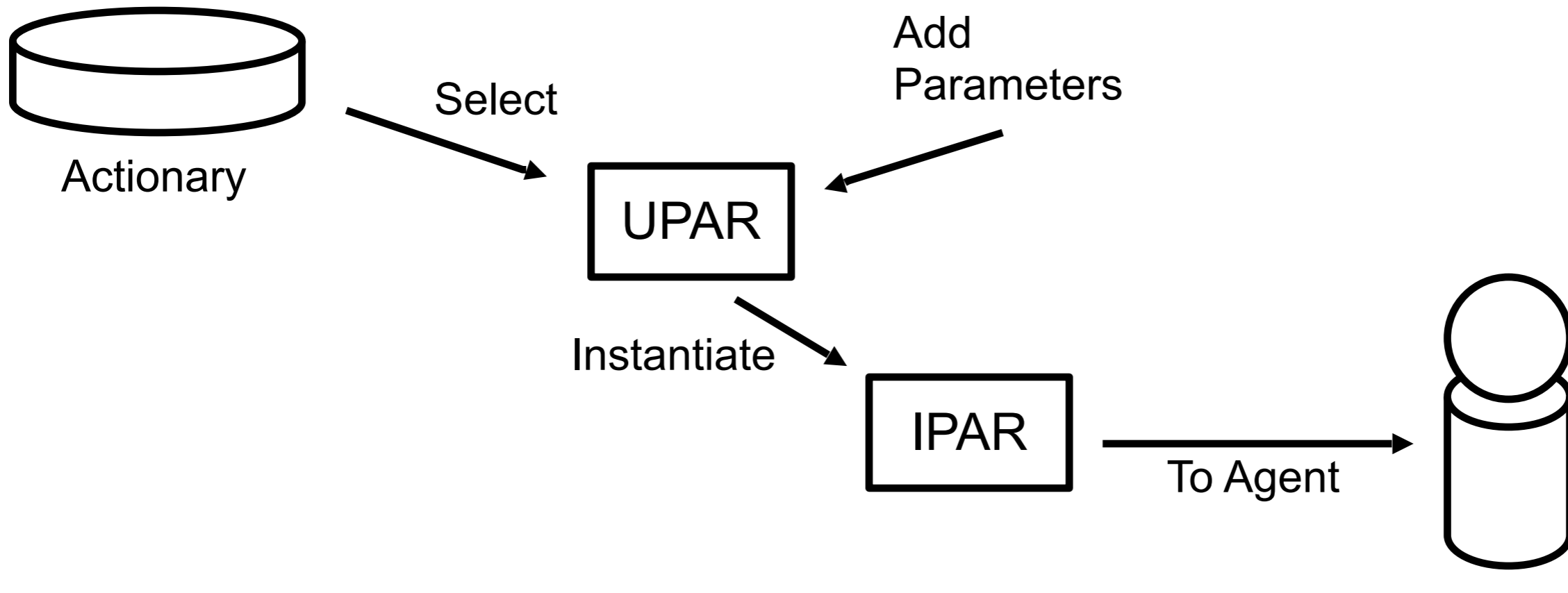
# Overview

- **Background**
  - Parameterized Action Representations
  - (Parameterized) Behavior Trees
- **PBTs and Event-Centric Control**
  - Human/Robot Interactions
  - Functional Virtual Populace
- **Future Work**



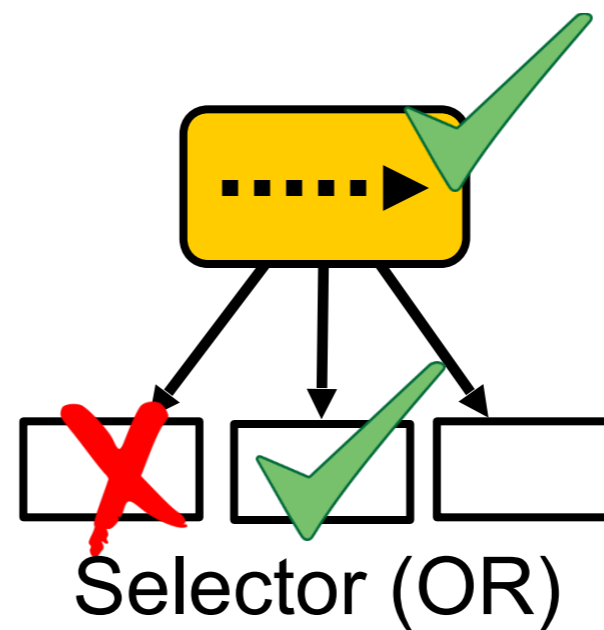
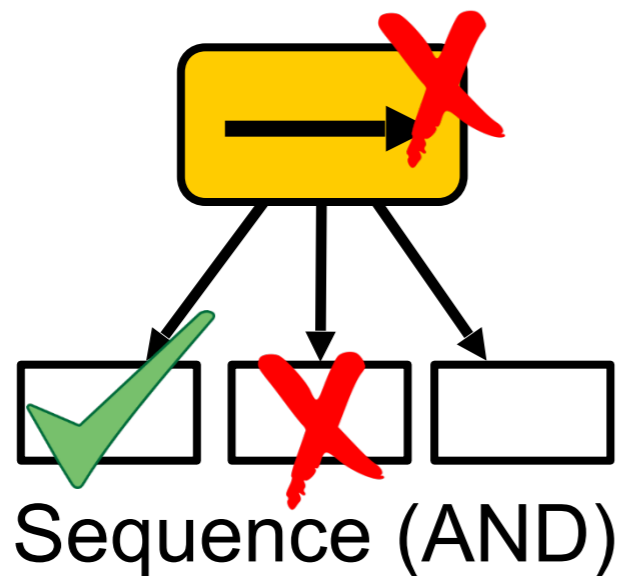
# Background: PARs and PBTs

- **Parameterized Action Representation (PAR)**
  - Knowledge frame for dictating and specifying agent actions
  - Selected from an authored database and instantiated
  - Based on a precondition/preparatory-specification system



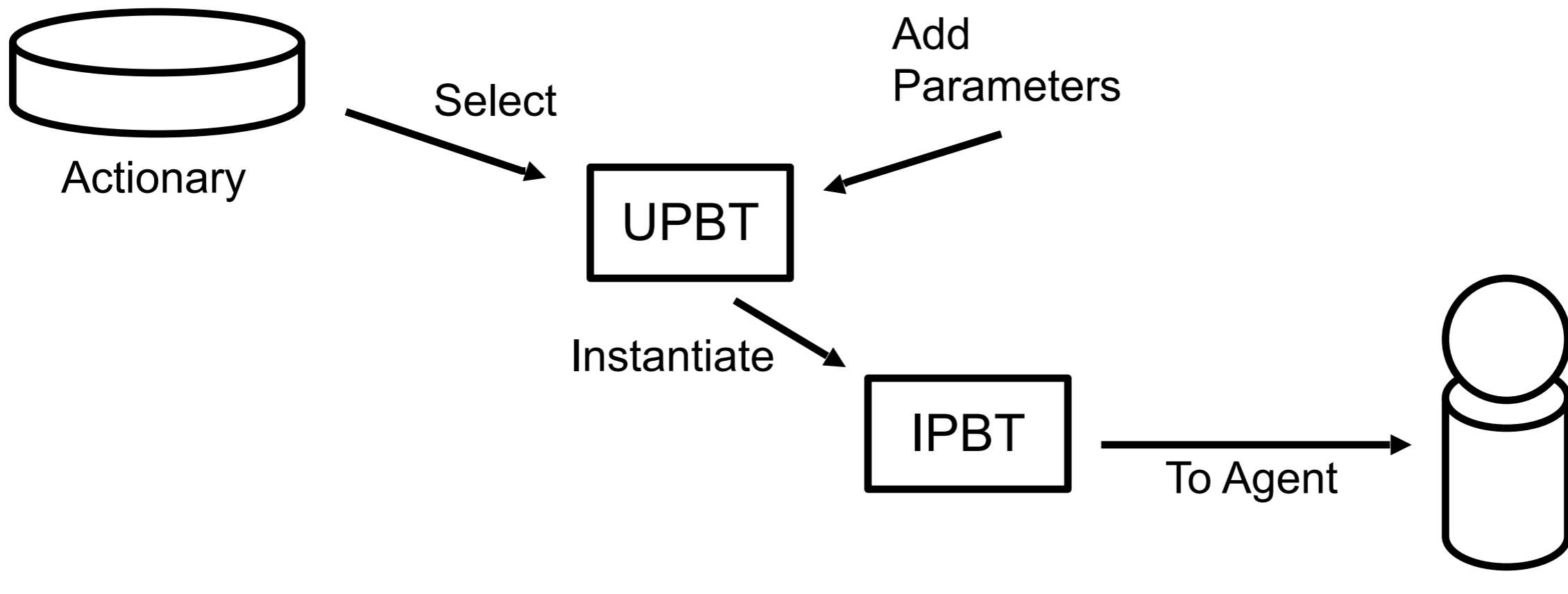
# Background: PARs and PBTs

- **What is a Behavior Tree (BT)?**
  - Alternative to Finite State Machines (and PaT-Nets)
  - Hierarchical, Goal-Directed, Flexible
  - Two basic rules for success and failure:



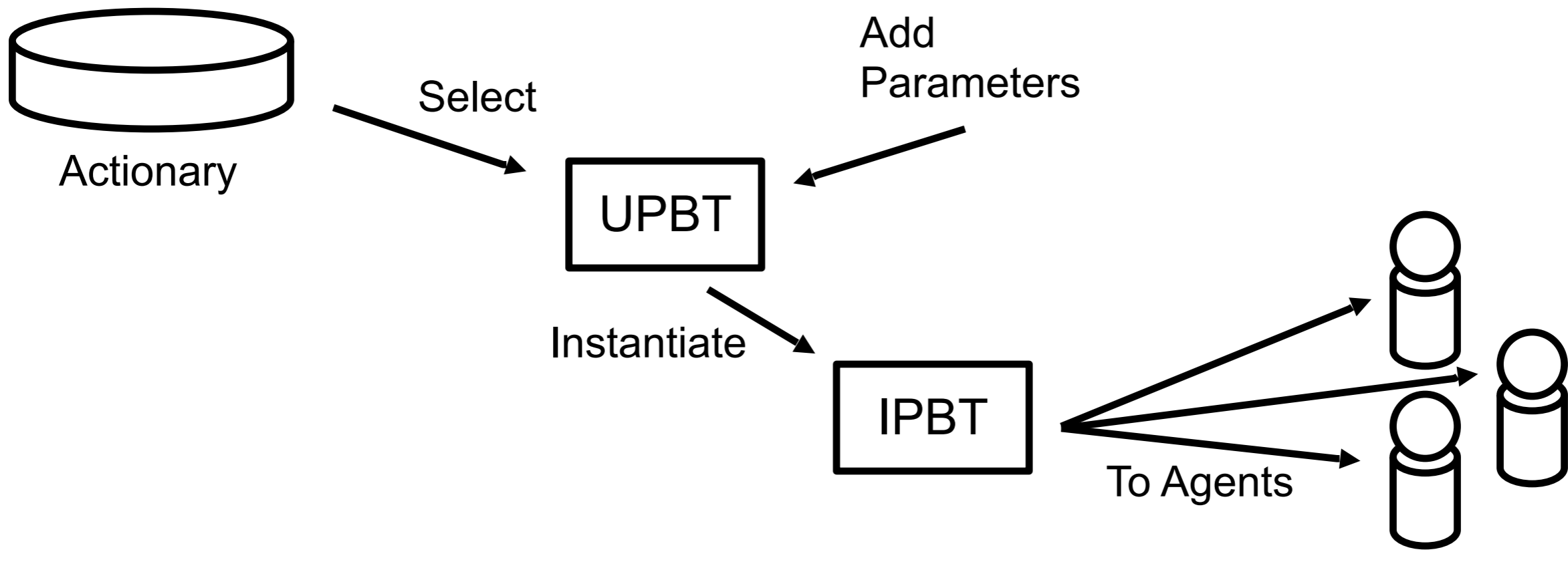
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- **Parameterized Behavior Trees (PBTs)**
  - More compact behavior logic than PARs
  - All of the advantage of Behavior Trees
  - Can parameterize actions through hierarchical lookup nodes



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- **Parameterized Behavior Trees (PBTs)**
  - More compact behavior logic than PARs
  - All of the advantage of Behavior Trees
  - Can parameterize actions through hierarchical lookup nodes
  - Can simultaneously control multiple agents



# PBTs for Event-Centric Control

- **Interactions are managed by Events**
  - Agents do not need to directly respond to one another
  - Easy to author collaborative or competitive behaviors
  - Greater author control over interactions



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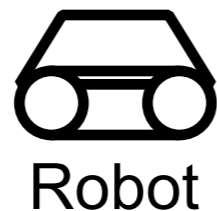


Robot



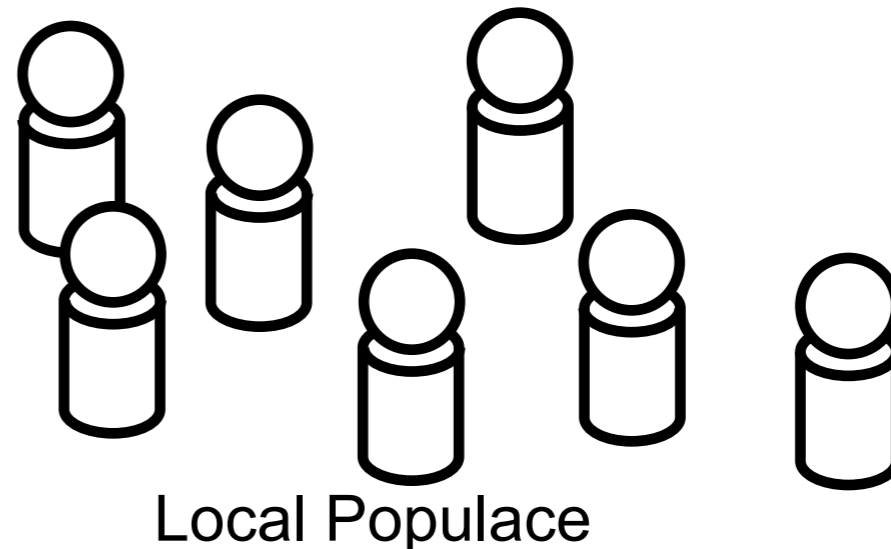
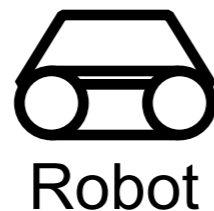
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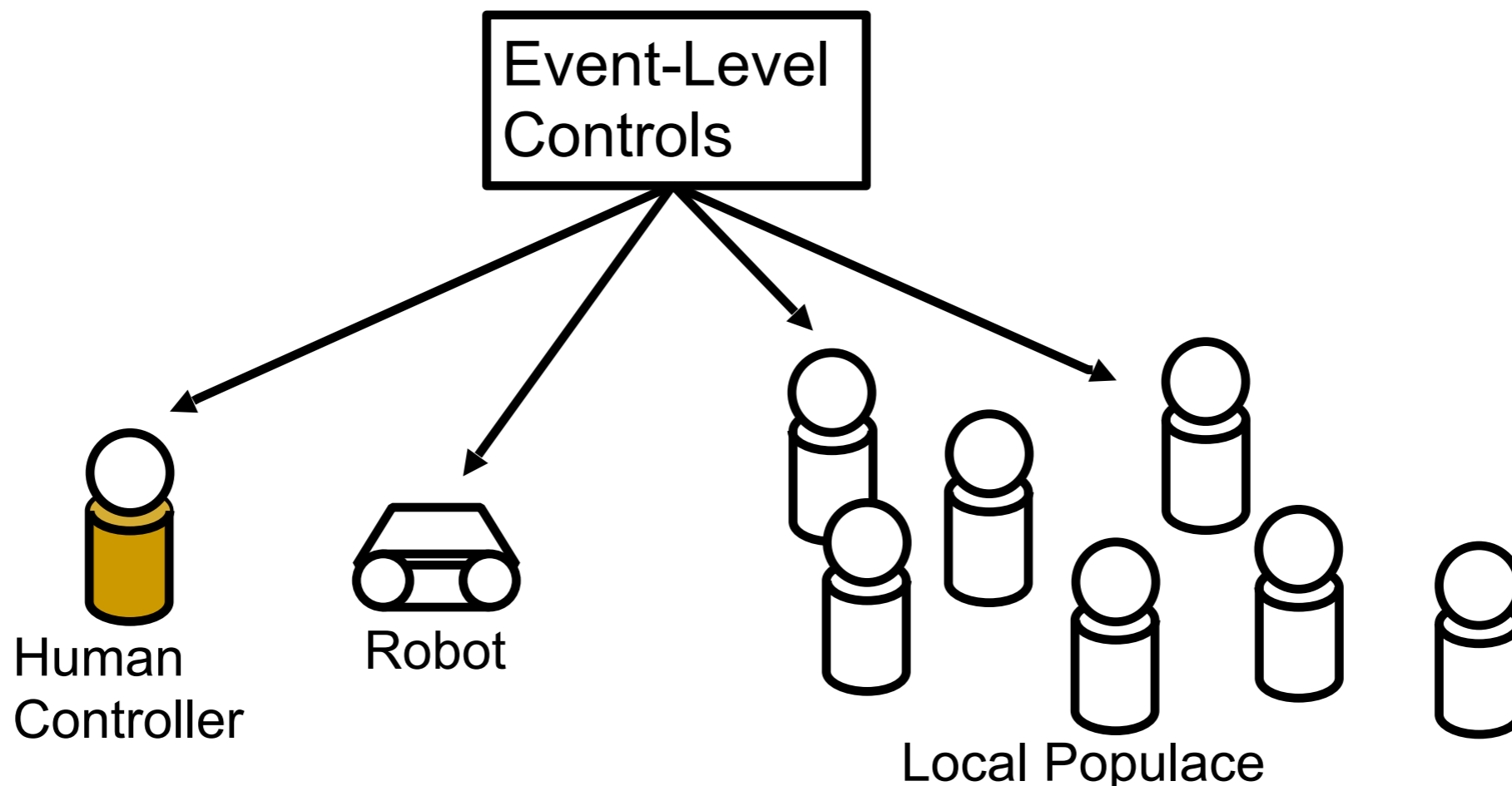
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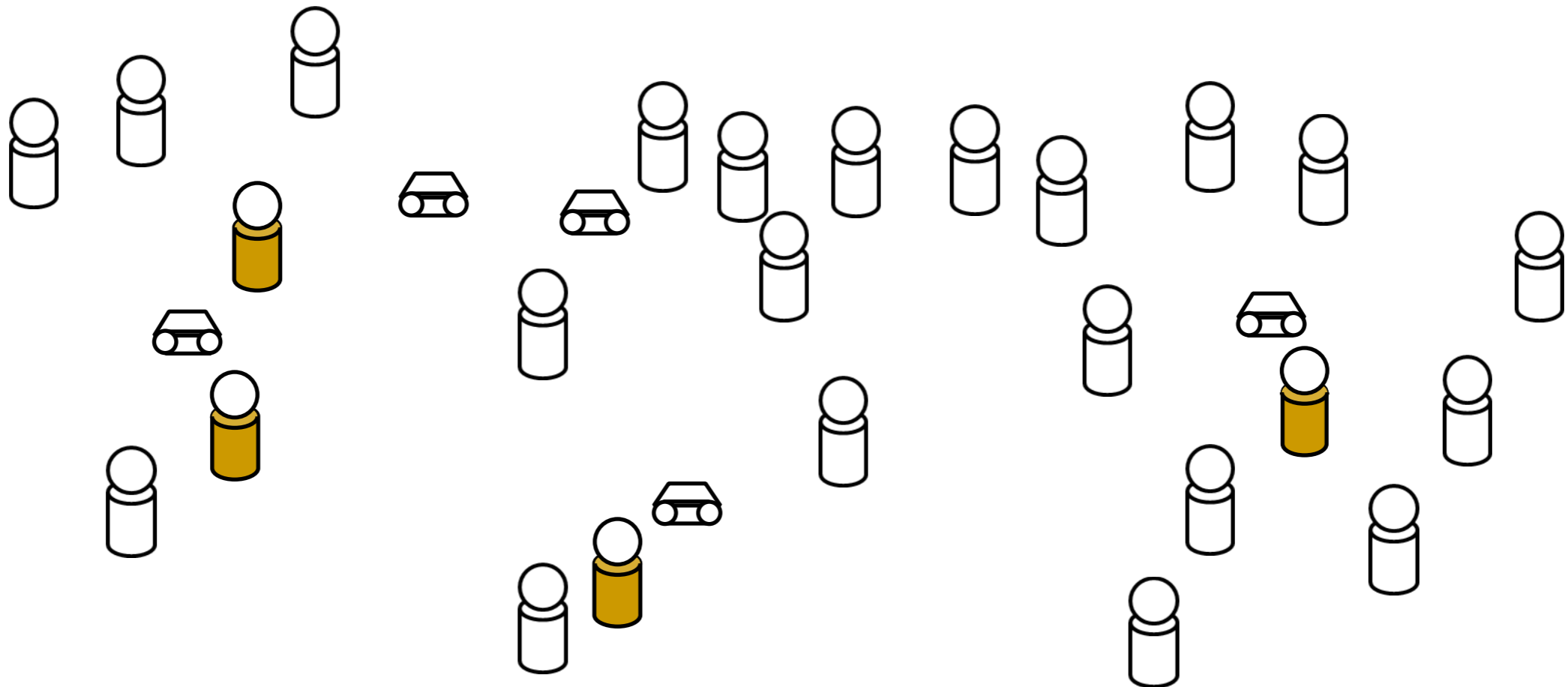
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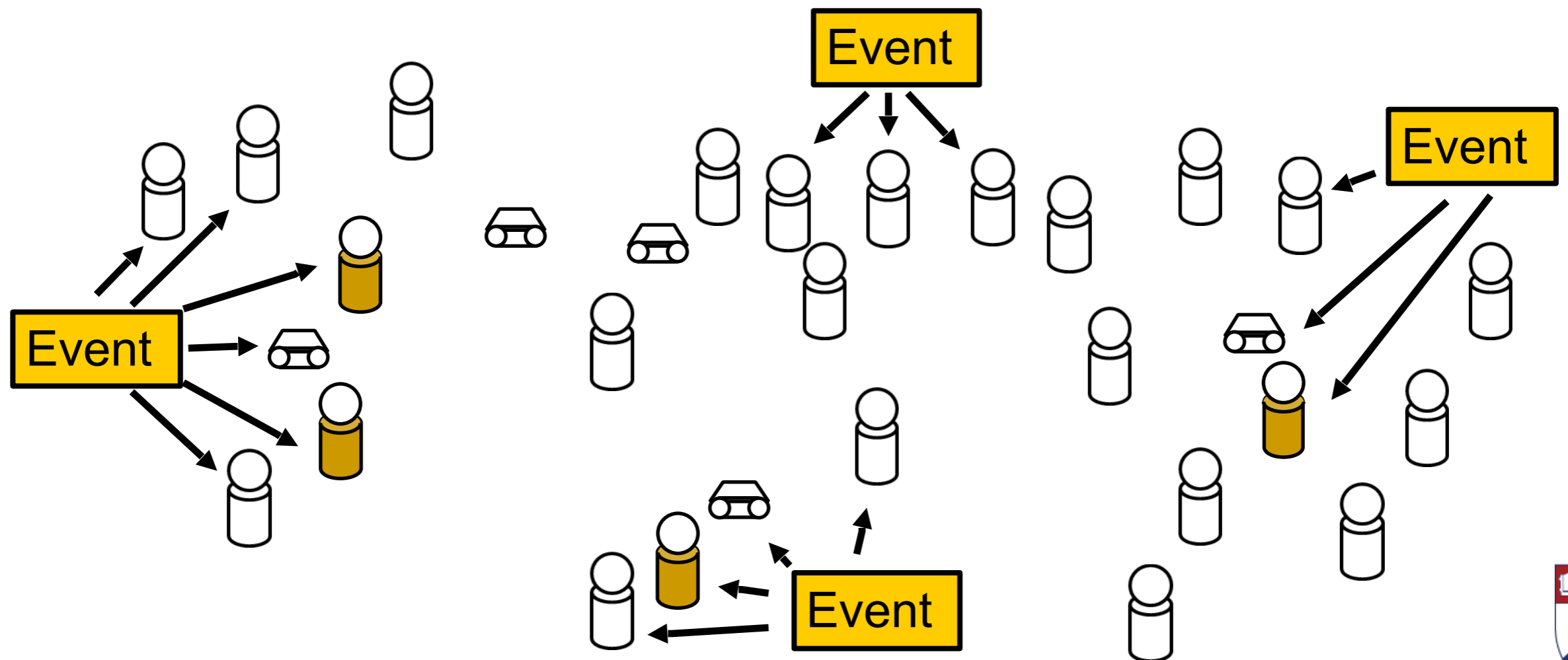
# Functional Virtual Populace

- **Coordinate all Agents (Human and Robot) Simultaneously**
  - Centralized control structure
  - Macroscopic control over the population behavior
  - Agents still act reactively when not involved in events



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# Conclusions and Future Work

- **Event-Centric Control**
  - Easier to author collaborative behaviors in events than in reactive agents.
- **Future Work**
  - Planning in the event space
  - Abstracted scenario narrative specification

